

Prey Lang

TRADITIONS, DEVELOPMENT, AND CLIMATE CHANGE IN THE
CONTEXT OF COLLABORATIVE MANAGEMENT

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List of Abbreviations

MoE	Ministry of the Environment
FA	Forest Administration of the Ministry of Agriculture, Forestry, and Fisheries
PDoE	Provincial Department of the Environment
PLCN	Prey Lang Community Network
PLWS	Prey Lang Wildlife Sanctuary
MTG	Meeting notes
CFN	Community Field Notes
GD	Group Discussion
FN	Field notes
KT	Kampong Thom
KR	Kratie
ST	Steung Treng
PV	Preah Vihear

Executive Summary

BACKGROUND AND RESEARCH OBJECTIVES

Forest degradation contributes to ecological and climate instability, foreclosing all possibilities for mitigation. At the same time, forest resources such as timber, metal, and land for agricultural production are vital for economic development. In Cambodia, economic development stalled while the country and region suffered war for over thirty years from the late 1960s through the late 1990s. Instituting democracy in Cambodia restarted the wheels of economic development as sanctions lifted, making space for national and international investments to exploit Cambodia's resources (World Bank 1993; World Bank 1992; World Bank, UNDP, and FAO 1996). Since that time, the impact on resources in Cambodia has been profound and forest loss is among the most visible. In May 2016, Cambodia's Ministry of Environment (MoE) captured nearly one million hectares of viable forest land in an effort to slow forest loss and improve forest governance. The Prey Lang Wildlife Sanctuary (PLWS) is the largest of these and involved a jurisdictional shift of forest management authority of 432,000 ha from Cambodia's Forest Administration (FA). At the same time, the MoE declared that they could not effectively manage these new forest resources without collaboration from local communities and government authorities at all levels.

Attempts at collaborative forest protection activities between rangers for the MoE and members of the Prey Lang Community Network (PLCN) have been ongoing since May 2016 and this research aimed to understand the dynamics of these interactions from two perspectives. The first is to understand the traditional practices through which people lived sustainably in this forest for thousands of years and the dynamics of economic development related to those practices. To unpack these perspectives our method included participation in forest patrols and the collection of data at the village-level. The overarching question is whether communal recognition of the 'owner of the water and the land' ម្ចាស់ទឹក ម្ចាស់ដី, also called lok ta, arak, or neak ta, can create a common language across the multiple stakeholders in the region? The second objective is to understand the dynamics of collaboration between the MoE, PDoE rangers and the local communities and authorities. Research was conducted amid contradictory reports of this latter situation. One understanding of the situation puts local communities at the forefront of continued forest loss, claims decreases in forest destruction, but admits limited capacity to fully stop the problem. The other report claims continued forest loss, increases in migrant incursions, and unchanging relations between land/timber buyers/sellers and officials at multiple levels. We find both to be true.

METHOD

Research was conducted between June 2017 and February 2018. The research team consisted of two persons, the lead researcher, Dr. Courtney Work, and one primary assistant, Mr. Sien Sothea. In each province, we worked together with PDoE rangers, members of the Prey Lang Community Network, village chiefs, and local villagers inside and adjacent to the PLWS. We participated in forest patrols in each of the four provinces and visited villages inside and adjacent to the protected area in each of the four provinces. We visited a total of 28 villages and four ranger stations during the course of the research, interacting with over 300 persons. We used a number of methods for data collection that include participatory action research collecting and recording data together with PLCN members and rangers, and participant observation recording data about the

interactions and activities of the group. We also conducted formal and informal interviews with villagers and migrants, and group discussions that consisted of drawing community maps and constructing history timelines. Data was analyzed in relation to policy and legal documents pertaining to forest governance, protected area governance, agricultural development; also in relation to previous studies and histories collected from Southeast Asia that pertain to the 'owner of the water and the land', and in light of other and on-going research in Prey Lang since 2000.

FINDINGS

- **Traditional Practices**
 - Every village reports dramatic changes in forest health and the vitality of traditional practices, which are linked. As the forest falls, capturing access to money becomes more important than respecting the resources that make the money.
 - People report asking permission from the 'owner of the water and the land', which is present in all places, to settle the land and use the resources
 - Reports across the forest agree that marked changes to traditional practices and forest health began between 2003-06 and transformed intensely starting in 2013-2015
 - All villagers report dramatic decrease in forest animals and fish since 2013-2015
 - In the developed regions of the forest the only places where large trees or dense forest remain are at huts for lok ta and mountains that powerfully resist extraction and conversion.
 - Traditional practices are decreasing and only 35% of villages retain strong traditions
 - Reasons cited for decrease
 - Loss of forest
 - Dependence on market for food
 - Loss of sharing large fish and game
 - Dependence on doctors for healing
 - Devaluing of traditional healing
 - New diseases with no traditional cure
 - Loss of habitat for traditional medicines
 - Some diseases remain that only lok ta can cure
 - Loss of community solidarity
 - Increased sale of timber and crops
 - As the market consumes the forest, lok ta is less important for survival than market access
- **Cross-cutting themes related to forest health and health of traditional practices**
 - Plantation clearing
 - Clearing land for plantations requires asking permission from lok ta, as the owner of the land
 - Rapid expansion of migrant populations, who receive permission to clear plantation land from local authorities in both the sending and receiving provinces, disrupt this practice
 - Where there are migrants cutting new plantations, forest biodiversity has decreased markedly and rapidly

- Where there are roads there are migrants and trucks to buy market crops
 - When there is access to the market, traditional shifting cultivation converts to market crops
 - All locations report new land conversion by local residents
 - Shifting cultivation is devalued and market crops seen as more sustainable
 - Shifting cultivation is understood to use too much forest land
 - Resin and NTFP collection remain important livelihood strategies
 - It is also an important conservation tool, as resin tappers patrol their territories
 - Logging
 - The wood market remains vibrant. Slower than before but consistent with the availability of timber stocks in the forest
 - Buyers and sellers have free access to the forest
 - Relevant authorities did not stop all timber traffic leaving the forest
 - Selective enforcement
 - When informed by community of illegal logging activities, rangers did confiscate and document the already cut timber
 - Approval for timber cutting and transport can come from multiple locations, provincial or district governors, commune chiefs, rangers, or PDoE
 - Construction is on the rise
 - Homes, temples, schools, and celebration structures at powerful sites in the forest
 - This use is consistent with forestry laws, but larger and more luxurious buildings are evident
 - Supplies a cover for continued flow of timber out of the forest
- Development
 - New road development in Preah Vihear and Steung Treng provinces has transformed villages.
 - Large numbers of new migrant populations are reported in Steung Treng province, with 5 villages in and adjacent to PLWS reporting over 90 new migrant families since 2015.
 - Plantation clearing and development form a continuous landscape from outside to inside the PLWS boundary on the road from Morn to Anlong Jrae
 - Much of the northern area of the forest is succumbing affected by plantation clearing both before and since 2016 (Annex 1)
 - Where the roads are light, Kratie and Kampong Thom, there is less visible forest conversion from the satellite
 - Recent road improvements in this area, however, increase access to the market and drive forest conversion (Annex 2)

- All villages, especially those in the undeveloped southern regions, are actively working toward village development
 - Planting market crops: cassava and cashew especially
 - School building
 - Temple building
 - Ceremonial buildings at Prasat and sacred places
- Very few cows and no buffalo remain as part of local livelihoods
 - Change began in 2013
 - Loss due to illness
 - Sell to buyers
 - Use money to buy tractors
- Decreased health reported in all locations
 - Before traditional medicine could cure 90% of illnesses
 - Much more and new illness since 2013(5) “Sick all the time”
 - Rely on doctor medicine (80%)
 - Works quickly but illness returns
 - Expensive (drives debt)
- Collaboration
 - We find that the claims made in the conflicting reports of the situation in PLWS mentioned above are all correct.
 - There are open lines of communication between MoE rangers and PLCN patrollers
 - Lines of communication between provincial, district, and commune officials are not consistent. In some places open, in others less open.
 - Of the villages we visited, only a few could be considered for effective collaborative management at the village level, but more targeted research is required to develop strategies for viable transitions toward developing collaborative management regions.
 - At the base of Phnom Gee- Roulea Thom, Roulea Doit
 - Growing, but very little market plantation conversion in this area
 - Year-round access to water for growing subsistence vegetables
 - In Preah Vihear- Pnyak Roleuk, Srie Viel, Jamrarn,
 - Vibrant wood trade would have to stop here before any meaningful management of the forest can occur
 - If the former is possible, there are leaders and interest in the forest
 - Beung Chas/ Siembok
 - Think Biotech activities would have to stop where they are and not continue to the north
 - From these three village regions, two large collaborative management areas could be developed.
 - One that stretches from Chey San in Preah Vihear to encompass Sprong village in Steung Treng.
 - One that stretches from Kratie to Phnom Gee across the south of the protected area.
- Climate Change
 - All villages report climate change effects and environmental degradation

- Some people (5%) reported no knowledge of climate change
- Most (80%) know what they experience, or hear on the news and weather reports
 - Extreme temperatures
 - Draught
 - Rain out of season
 - Intense storms (no longer protected by the forest)
- Very few people are aware of the causes of climate change
 - Most (80%) believe it comes from deforestation
 - Some (20%) are aware that factories, garbage, and war are also drivers of climate change
 - None were aware that gas-powered machines caused climate change
 - None were aware of the role of high-input agriculture in climate change
- Villager recommendations for climate change mitigation
 - Replant trees in the forest
 - Protect the forest
 - Close the wood market, especially by targeting buyers
 - Slow down development
 - Close factories
 - Increase attention to religion and lok ta, “the new ‘stuff’ is now raised higher than religion”

Traditional practices are intimately connected to shifting cultivation, hunting, healing, and community solidarity, but especially forest health. Since 2013(5) forest conversion to plantation has reduced the forest surrounding once isolated and market-independent villages. Village solidarity has decreased in all locations where people report social relationships with money that are stronger than social relationships between villagers. The health of villagers, of lok ta, and the forest are intimately connected, and as the forest falls, people report the conversion of swidden forests to market crops, the absence of game in the forest, decreased health, fractured solidarity, and decreased use of forest knowledge.

RECOMMENDATIONS

MoE

- The forest is extremely compromised
 - Urgent need to stop further road construction
 - Urgent need to identify, demarcate, and patrol the core area
- Train MoE staff and all communities inside the protected area about climate change
 - Be aware that development organizations are not neutral, un-biased sources of information about climate change, causes, effects, and possible strategies
- The Ministry of Environment has jurisdiction over all land-use activities inside the boundary of the protected areas.
 - Stop the timber traffic
 - The ministry will be unpopular with villagers, and local, district, and provincial authorities
 - This action could also provoke national level actors

- Forest health is impossible without it
 - Respect the work of community patrollers
 - Promote independent patrols
 - Promote un-scheduled/ spontaneous patrols
 - Respond to forest crimes in accordance with protected area laws
 - Stop the influx of migrants
 - Village heads report pressure to accept migrants
 - Can also profit from migrant land claims
 - Pressure is reported to come from provincial and district level authorities
 - Problem framed in terms of population growth
 - Discourage new construction inside the protected area
 - Encourage use of dead stockpiles before living trees are cut
 - Pursue cooperative land management arrangements in as many village areas as possible
 - Establish jurisdiction over the protected area
 - Promote dialogue with migrants inside PLWS
 - Village heads may not have authority over or relationships with these residents
 - Stop the conversion of forest toward market crop production
 - Conversion areas suffer massive species decline
 - Promote cooperative livelihood strategies
 - Promote agro-forestry techniques
 - Promote, support, and cultivate resin collection
 - Enforce the law against motorized vehicles inside the protected area
 - Strictly curtail machine use – only patrollers
 - Stop the traffic of plantation trucks hauling lumber across the protected area
 - The road facilitates resource extraction
- Close the mining concession inside the protected area
 - It is affecting water sources that feed the forest and flow into the Mekong and Tonle Sap rivers
- Do not pursue hydro-dam or other development projects inside the protected area

PLCN

- Establish regular, independent patrols in the core areas
 - Begin demarcating the area
 - Perhaps ordain the trees at the boundary zones in a joint celebration with the MoE
 - Initiate and coordinate collaborations with MoE to report forest crimes
 - Initiate and coordinate collaborations with conservation organizations to record and preserve natural resources in the protected area
- Avoid organizing as a bureaucratic entity
- Promote multi-village cooperatives that can establish and manage collaborative jurisdiction inside and adjacent to the protected area.
 - Convert community forest areas into these collaborative management areas
 - Attempt to enlarge CF to extend into protected area

- Tenure not limited to fifteen years
 - Can incorporate larger land areas
- Promote market-independent livelihood strategies
 - Explore alternative market possibilities, like agro-forestry
- Promote respect and care-taking of natural resources, following long-standing agreements with lok ta
- Increase the production of vegetables, fish and meet toward cooperative food security with minimal forest pressure inside the protected area
- Discourage motorized vehicles and equipment within the protected area

Conservation Organizations

- We do not provide data on conservation initiatives in this report as none are active at the moment in Prey Lang, but conservation initiatives have impacts on forest health and are included in our recommendations
 - Understand that local swidden, fishing, or hunting activities are not the primary driver of natural resource over-exploitation
 - Understand that plantation development, mining operations, and illicit national and international timber extraction and wild animal trade are the primary drivers of deforestation and biodiversity loss
 - Local populations become involved in timber and animal trade, but do not create the value chain.
 - Work within existing systems and do not create and fund new conservation groups. Effective collaborative management requires organizations to collaborate with grassroots conservation initiatives.

Introduction

The Prey Lang forest remains the largest contiguous lowland forest in Indochina (Hayes et al. 2015; Turreira-García et al. 2017). Although this status continues to deteriorate (Argyriou, Theilade, and Grahm 2017), the area also continues to attract the attention of international donors for conservation efforts (Pech 2018). Prey Lang was established as a protected area in May 2016, at which time the MoE went to great lengths to capture as much forest area as possible, adding over 100,000 ha to the initially proposed area in response to stakeholder concerns (Pye 2016). In addition, there was considerable discussion of the role of communities and local level authorities in protecting forest resources (RGC 2016), and the new code of environment and natural resources will draft and pilot some form of collaborative management initiatives for protected areas.

There is growing evidence worldwide of a strong relationship between the health and long-term viability of the environment and natural resources and strong beliefs in ideologies in which people honor the sovereignty of non-human entities over territories and natural resources (Dooren, Münster, and Kirksey 2016; Howell 2015). Limited evidence supports the vibrant health of forest and water resources in environments where belief in the ideologies of development and economic growth are dominant. Theories suggesting that environmental degradation first increases and then decreases with economic growth (the 'environmental Kuznets curve') cannot account for the long-term effects of climate change (Katircioğlu and Katircioğlu 2017), nor do they stand up against the realities of income distribution (Stern, Common, and Barbier 1996), and continue to be contingent on substantial changes to existing development strategies (Allard et al. 2018; Pao and Tsai 2010), which are not forthcoming. There is, however, mounting evidence of forest and ecosystem health when people conduct everyday activities in landscapes filled with social meaning and ecological significance (Basso 1996; Bender 2006), under the governance of non-human entities, in Cambodia called the 'owner of the water and the land', that share characteristics with similar entities globally (Blaser 2013; de la Cadena 2015; Povinelli 1995). Studies, including this one, continue to confirm that these entities enforce social relationships among human communities and conservative, respectful, and relational environmental practices in landscapes (Bird-David 1999; Howell and Howell 2017; Ingold 2000; Sahlins 2017; United Nations 2008).

This is important in light of the current transformations of the Prey Lang forest since its establishment as a protected area in 2016. We find that the efforts of the MoE to capture the forested areas of Preah Vihear and parts of Steung Treng are being thwarted, especially by dramatic plantation conversion and road development in those northern regions. Satellite images in Annex 1: Prey Lang Deforestation, show that unaffected forest areas in Prey Lang nearly match the originally proposed map of 300,000 ha that was opposed by stakeholders. The lives of local residents have been transformed and while they do not yet have access to all the health care and education promised by the development, they understand the contradictions in their changing social systems away from forest dependence and community solidarity toward dependency on markets and money to ensure adequate access to resources (De Angelis 2001; Graeber 1996; Marx 1887). There is growing concern among some, but not all, stakeholders from the various constituencies that current rates of forest transformation and declining biodiversity are unsustainable and that the

well-known tension between economic development and ecological health (Kutter and Westby 2014) is not in balance.

The current state of collaboration between communities and the various local and national level authorities is fractured, not broken but presenting multiple interpretations of law, conservation, and sustainable practices. Our findings reveal accusations of corruption, illegal clearing and logging, as well as complicity in forest crimes flying in all directions. Each group of stakeholders has some representatives involved in furthering destruction, as well as those attempting to stop it. Every accusation from all sides is correct. The majority (but not all) of the villages inside the protected area are cutting timber and selling it to buyers who are known by particular (but not all) local authorities, including village and commune chiefs, district and provincial governors, police, soldiers, and provincial level FA and MoE staff. The timber trade remains open and visible everywhere and is now complemented by intensifying encroachment and plantation conversion from internal migrants. This creates an environment of mistrust across all sectors. Mistrust is not a disfunction. It is a rational strategy for social organization that is at once protective of existing social structures and productive of new possibilities. What is important is to recognize the particular social characteristics and manifestations of mistrust, which must be understood in their own context (Carey 2017). Trust suggests that the future is certain. Our collective future is not at all certain, and as the effects of climate change intensify amid rapid resource depletion it may be that an environment of mistrust will be more adaptive to the coming instabilities.

It is possible that the worsening effects of climate change will facilitate social and economic transformations globally. As the deterioration of environmental services confront policy makers and affect national and international capacities to deliver services promised by economic development, new conversations about how we define development find space to flourish (Daly and Farley 2010; Escobar 2015). This conversation is emerging, but the stronger push from national and international investors is toward increased conversion of natural resources toward market production (AFP 2013; Beresford 2017). These activities suggest a limited or naive understanding by policy makers of the drivers and effects of climate change as understood by scientists (IPCC 2013), which could compound its coming effects. Although knowledge about climate change is increasing, especially among officials, it remains limited. Also limited are strategies for mitigating or adapting to its effects. Ordinary citizens know very little about climate change, and those with less access to formal education and news media have even less understanding. When even limited knowledge of climate change is only held by officials, this can degrade the value of local knowledges as local people can be left out of the conversation despite being fully aware of many of the drivers and effects of climate change through personal experience (Rosengren 2016).

The personal experiences reported below relate to the spatial and temporal relationship between traditional practices and forest health, economic development, and climate change effects. The two most important findings, for us, are first, that all locations inside the protected area report dramatic decreases in wildlife, water availability, and forest health, and these are most acute where the roads and markets of economic development are strongest. Second is the finding that in highly developed locations, the only places with remaining dense forest or large trees are those associated with strong lok ta.

Methods

CO-PRODUCTION OF KNOWLEDGE AND PARTICIPANT OBSERVATION

This study is part of long-term research conducted by the authors in the Prey Lang region. The first author is a trained academic researcher and the second author is a member of the grassroots community network active in Prey Lang. During the course of research since 2014, we have engaged in activities that train community members in research methods and we have also trained community members and MoE rangers to use GPS, drone, mapping technologies and other research tools useful for natural resource protection. Rangers, network members, and community members were instrumental in teaching researchers about traditional practices, locations of powerful spirit forest areas, and the relationship between natural resources and lok ta. For this section of the study, our questions sat at the intersection of climate change effects, relationships with the ‘owner of the water and the land’, interactions with development and the market, village histories, and collaborations across stakeholders in the PLWS region (Annex 3).

Activities were conducted between June 2017 and March 2018. We met with a total of 338 stakeholders inside the Prey Lang forest; 241 local residents, 77 migrants, 17 rangers, and 29 local officials. We conducted a total of 36 group discussions, 25 individual interviews, and participated in forest patrols.

FORMAL AND INFORMAL INTERVIEWS, GROUP DISCUSSIONS, LAND-USE MAPS, AND HISTORY TIMELINES

Both formal and informal interviews were conducted with stakeholders at multiple levels of this research project. Annex 3 provides a list of questions asked of participants. Not all questions were asked in all circumstances and interview participants often answered questions beyond those asked. Their responses are included in the analysis. In addition to interviews we conducted structured group discussions with village participants. These participants were gathered together with the help of village chiefs or community representatives. We specifically asked for older residents who would have memories and experiences from the area and requested gender inclusivity. If the maja srok was available in indigenous villages, we requested his participation.

The group discussion consisted of three sections. The first involved drawing landscape maps of formally recognized villages and their land use outside the village. This included areas of social and economic production like swidden fields, rice fields, market crop fields, rivers, trails, and roads, as well as graveyards, mountains, and lakes (trapiang) that are significant in traditional beliefs. In villages that were not officially recognized, we did not draw a map, but constructed only a history timeline gathering verbal data about land use. In retrospect, we should have drawn maps together with all villages regardless of their official status. As a complement to the mapping exercise, we flew a drone over the villages and photographed the area from above. See Appendix 2 for this data.

The history time line was constructed differently in each village. We asked about possible origins of the village and began the timeline in an era when most participants would have living memory. From there, we marked time according to dramatic shifts in people’s living conditions from earliest memories to the present. In all villages, we omitted the three years, eight months, and twenty days of Khmer Rouge sovereignty, because this was a time of great upheaval across the country. We included, the time immediately following Khmer Rouge ouster whether or not villagers returned to

their home villages. The dates of dramatic social and ecological transformations were discussed and decided among participants and people were asked to recount experiences related to traditional practices, especially lok ta and resource use, to economic development, and to climate change. Their discussion was recorded.

LIMITATIONS OF THE STUDY

There were limitations to this study, both expected and unexpected. The main limitation understood from the beginning was the lack of participation observation data collection at the village level. We spend only one day and evening in each village, which is insufficient time to understand the stories behind what people report in group discussions or interviews. Sometimes participants purposefully lie in interviews or group discussions, but most often they report what they wish were true or what they believe the researcher is looking for. Participant observation is the best way to overcome this, which does inform our data related to collaborations between PLCN and relevant officials at the ministry, provincial, and local levels. In village-level studies, we overcame this through multi-site triangulation, which provided consistent (or inconsistent) responses to confirm our results.

Another limitation to this study was our difficulty meeting with migrant populations in Steung Treng, where encroachment is the strongest. We requested village chiefs to arrange two meetings for us. One with original residents, to do village maps and history timelines, the other with new residents. New residents did not ever show up to meet with us. In addition to skewing our data to only partially represent the voices, beliefs, and experiences of migrant populations in the area, this lack signals important communication issues between village-level authorities and new residents inside the protected area. As will be seen below, this is already creating challenges for managing the protected area.

Gender inclusiveness was also an issue in data collection. Even when we explicitly asked for female participants, sometimes the group was all men. In addition, our method contributed to gender segregation on two fronts. First, our participation in forest patrol activities created a strong gender imbalance, as we encountered only one woman on patrol in all four provinces. This is a complicated exclusion, as many women are not interested in forest patrol, but they are also 'prohibited' from participating by husbands and/or fathers. The other gendered exclusion became apparent as we saw that women were not interested in drawing the community maps. By the time map-making was completed, many women had wandered away to do more interesting things. At first, we started with mapping but switched to do histories first. This helped, but it remained difficult to get women involved in all locations.

In terms of recommendations and plans for developing collaborative management areas, these are preliminary. More participant observation and practical discussions about establishing collaborative management areas would be necessary to make concrete suggestions.

In the following sections, we will discuss our findings related to the interactions between traditional practices, economic development, and climate change in the PLWS and how this informs possibilities for collaborative management of the natural resources in the area.

Traditional Practices

From the time before the kings of Angkor until today people living in and around Prey Lang (across Southeast Asia and much of the world) cultivated social relationships with an Original owner of the water and the land. This sovereign entity exists as the water and the land that supports all life, and grants or refuses access to territory and resources. In the villages we visited, one-hundred percent of people reported long-standing practices that require asking for permission to claim land for homes and plantations, to extract minerals, and to trap fish and forest animals. “Our belief comes from ancient times, and we don’t really know all the laws or stories. But, we know that if we are not sick and can find a livelihood here, then lok ta agrees to our activities” (KT, Rolea Thom, 7 Feb 2018). People in all locations report that livelihoods are precarious and illness is strong.

Every village we visited reports dramatic changes in forest health, in human health, and the vitality of traditional practices. The changes began between 2003-06 and transformed markedly with dramatic decreases in forest animals and fish, accompanied by impacts from floods and droughts starting in 2013-2015. This is important in a region that was strongly impacted by Cambodia’s many years of war. While the war years were times of fear and hardship, we heard that, “Pol Pot only killed the people- they didn’t affect the forest or the animals. Things started to change and get bad after Pol Pot” (GD ST Morn 19 Jan 2018). Every location reported that fruits, vegetables, fish, game, and clean water were abundant during the post-Khmer Rouge wars. “The shortage of animals in the forest did not come from the wars” one middle aged woman said. “There was so much food here. Up until 2008 we only bought fish sauce and salt. Everything came from the forest” (interview, PV 23 June 2017). When we had the forest we were together- lok ta was strong... We went to look for meat and we believed we would find it. If we lost a buffalo, lok ta helped find it. Then, we would bring a chicken and a liter of wine for lok ta and eat all together. We were fine, happy. But, if we don’t keep our promise, or share the offering with lok ta, we will get sick” (GD ST Anlong Chrey 20 Jan 2018).

People engage with lok ta as an unforgiving, but understandable entity. “If you don’t respect lok ta’s areas, you’re either sick or dead” (GD-KR 3 Feb 2018). There are areas that belong to lok ta and from which people never take resources—from particular mountains, lakes, or streams. Even Buddhism is excluded from these sites and one monk nearly died in Viel Po, Steung Treng after attempting to build a temple on top of lok ta’s mountain (interview 20 Jan 2018). In all other areas, access is intertwined with the owner of the territory. “Lok ta can close off our access to the crystals. Some people couldn’t find anything here until they made an offering (GD KT Rong Japon 9 Feb 2018). Typically, people state clearly what they will take, “we ask for one, we get one; we ask for two, we get two. We would never take anything else” (GD-KR 3 Jan 2018). If you ask for one and try to take two, however, that second one will never come. But, people now understand that, “if you ignore Lok Ta, you can take as much as you want- no problem” (GD-ST, Anlong Chrey 19 Jan 2018).

For many, this is the way of the future. “The authorities and the loggers do not respect maja tuk maja day. They just cut whatever they want and think only about their own profits” (GD-ST 27 June 2017). “In the old days we would never cut the big trees. Only in this era do they cut and not care” (GD-KR 3 Jan 2018). There has been a dramatic increase in wealth for many living in or around the forest in recent years, which will be discussed further below. Here, we share how people report the impact of these changed practices on their lives in terms of community solidarity, human health, and the effects of the money economy on their communities.

All villages report that community solidarity, care taking, and resource sharing have disappeared. “Lok ta is about solidarity, not looking down on each other, not bad talking, no anger... (KT 14 July 2017). For example, “before, whenever we caught something we would share the meat with everyone” (GD ST P’auv 21 Jan 2018), and now, “I never eat the fish I catch in the Mekong. It’s too big for my small family, so I sell it and buy food” (interview, fisher KR, 3 February 2018). “We always helped everyone, some families would be short one year and have plenty the next year- others would lack from year to year. It was fine, we had enough and no one was left hungry. Not like today, when it’s only money. If you don’t have money, you don’t have anything...” (GD PV Thmea 16 Feb 2018). “We never used to donate money for the annual ceremony for lok ta, we would just give the meat or rice, whatever we had we gave” (GD ST Spong 26 Jan 2018).

People report lower attendance and decreased offerings for communal lok ta celebrations in all locations. “When I was young, the maja srok would come and bang on the houses collecting offerings for the celebration. All the children would run out and follow the collection parade. The elders joined in as we passed their homes... they were happier then... now they’re busy with their plantations during the fundraising and fewer people join in” (GD PV 15 Feb 2018). As the forest falls, capturing access to money becomes more important than social relationships and respecting the resources that make the money; Lok ta is less important for survival today than market access.

The decrease in traditional practices and the power of lok ta comes from a number of issues, most notable is forest loss. Forest loss is directly related to industrial plantation conversion, household land conversion for market crops, industrial timber extraction, and from local people selling trees to the vibrant timber market, which will be discussed below. This intensive extraction weakens the power of lok ta by physically taking the trees where the earth’s energies sometimes concentrate, and by destroying the community of plants and animals that also hold lok ta energy and sustain the human community. It also weakens local confidence in the power of the ‘owner of the water and the land’, which has never been based in belief, but in experience. If people cut the forest with disrespect and greed, they should get sick and have misfortune, but many do not. In fact, many become more powerful as they take more and more. This is a problem for those who worry about recent social and ecological changes, and proof for others that lok ta is superstition and people should follow the new ways and become powerful too. While individuals may become more powerful, there is strong consensus that the community is weaker.

Weakness is understood in terms of solidarity and collective action, but also in terms of physical health. Lok ta is deeply involved in health and healing and people report a strong connection between a decrease in the power of lok ta and the increase in illnesses. This is understood in two ways. One, is the idea that access to pharmaceutical medicine, “caused people to split their beliefs” (GD PV 17 Feb 2018), and this splitting of social energy makes lok ta weaker because people do not have as many celebrations. Another understanding is that people are lacking, for example, the forest medicine is harder to find, depleted, and far away. But also, the diseases are new and people don’t know what medicines to use, so they go to the doctor. Pharmaceutical medicines cure most illnesses, but people report an overall state of ill-health that is new since 2013. Before, “we had more healthy people than not, maybe one or two babies out of one hundred died before the age of 5. Old people would die... But more survived than died in those days (GD ST Anglong Pe 23 Jan 2018). Some diseases remain today, however, that only lok ta can cure, “this is why we still believe” (GD KT Snong Oun 10 Feb 2018).

These practices remain important, but lok ta is weaker now, as reported in all locations. Perhaps only 35% of the old practices remain with the people, and all the resources are gone. In our discussions it became obvious to participants that the punishments from 'Kos Lok Ta' (offending lok ta), which are illness, accidents, floods, droughts, and the inability to find forest animals and minerals, are all happening to them right now. People are clear that these effects are from companies, logging, migrants, corruption, and greed. They are not punishments from lok ta. But, the similarity between the reality of their current social and ecological situation and the promised punishments from lok ta did cause some speculation. "There has never been a time that we had no rain, like what happened in 2015" one elder remarked, while another proclaimed, "this doesn't come from lok ta, this comes from nature" (GD ST Spornng 26 Jan 2018). This position is interesting, as all scholarship on traditional practices from around the world and across time suggests that what local people recognize as "earth beings" or other sovereign non-human land entities like lok ta, are exactly the same thing that modern scientists recognize as nature (Descola 2013).

In another example, a younger man lamented, "it's true, now we don't have any gold left." While an elder man strongly stated, "but this doesn't come from lok ta, it comes from us doing rice chamkar, from us not having energy to look for gold, and from us focusing on our family" (GD KT Snong Oun 10 Feb 2018). The elder suggests that the gold is still there, but people are not looking for it. There is also the suggestion that lok ta has simply, and pragmatically, changed sides: "Since 2015, lok ta sells out to the highest bidder ('see somnok'), protecting the rich and punishing the poor (GD-KR 3 Jan 2018). But, the majority of people are pragmatic as well and simply point out that, "now no one worries about asking lok ta for anything, and now we are out of food" (GD ST Viel Po 22 Jan 2018).

At the current moment, in the developed regions of Steung Treng (excluding Spong, Krabie Mui, and Anlong Pe) and Preah Vihear (all villages), the only places with forest remaining have strong lok ta that cause injuries, illness, and death. The forest around the villages is gone, except where lok ta exacts retribution.

We end this section with one long quote from Steung Treng that speaks directly to the issues in Prey Lang: "The climate is so unstable. Now we have roads and market access, and 100% of people are growing crops to sell... But even if we grow for the market, we don't get a good price... Everyone is using chemicals and it affects our health.... Migrants come to buy our land and we sell them one hectare, but they clear everything behind it.... They come and do what it would take us 10 years to do.... They don't follow us when we sien lok ta, and they say we are backward. But since they came, everything is gone (GD Anlong Pe ST 23 Jan 2018).

Development

Forest transformation from development is most striking in the north, in Preah Vihear and Steung Treng provinces. In the south, in Kampong Thom and Kratie, there is much less. The north has been inhabited for hundreds of years by communities of Kuy indigenous people. Extensive and ongoing road development now connects villages to each other, allows new families to settle, and provides access to the market. In Preah Vihear, one long smooth road runs from Chey San district center into the protected area connecting to Srey Viel. In Steung Treng smooth roads reach inside the protected area as far as Anlong Chrey and Anlong Pe. Trucks selling market goods come daily and in the season, they come buying cassava and cashews. All but the two of the eight villages

visited, those not connected to the road, are converting swidden fields into market-crops, especially cashew and cassava (see Annex 4). In those six villages, they report 60-120 new migrant families, clearing forest and also establishing cassava and cashew plantations. Village heads (and former village heads) report pressure from provincial and district level governors to allow settlers into their villages. They also report receiving money for each family settled. Feelings about development among the Kuy villages is mixed.

“Before our life was really happy, but we were so far from the market. We are happy to make money and have the market, but there is much more suffering” (Anlong Chrey, ST 20 Jan 2018). They all feel the loss of forest and traditional ways of living, and they all are happy for the roads and markets and building for new homes and pagodas is on the rise. The few migrant families we met report only improvements, “at first, it was just like in the forest. Now it’s growing, lots of advancement. It’s easy. The road is easy and we can buy whatever we want. If we want to eat beef, before we can’t. Now we can! We can get whatever we want. Much easier” (Migrant Viel Po, ST 22 Feb 2018). None of the Kuy interviewed reported benefit from the new migrant families, but we were unable to meet with many of them and do not know what benefits they think they, as migrants, bring to the area. When we wanted to conduct group discussions with them, no one showed up for the requested meetings. Either village heads did not ask them, or they were asked and did not come. All meetings with Kuy took place as requested. This is worth further research.

In the south, where Khmer migrants slowly grabbed land and established communities of artisanal gold miners, cashew farmers, and resin tappers since the early 1980s (and loggers starting early 2000s), there is almost no development. But there is strong desire for roads and markets, and an influx of seasonal miners in the dry season. No one has memories of generational solidarity, celebrations, and abundant village life in the forest. The small settlements of migrants in the southern forest and around the base of Phnom Gee, want to sell. They came for gold and crystals, and now many also sell wood and cashews. One single large and smooth road cuts through the forest from the Think Biotech company to Kampong Thom and Kampong Cham provinces, and the company sends trucks full of wood 2-3 times per week through the forest. Along this road in Kratie migrant settlements at Trapiang Tia and Saum Depot have grown substantially in recent years. Most of these southern settlements in both Kratie and Kampong Thom are ‘developing’ in their own ways, building schools and/or worship structures at powerful sites in the forest (rock formations/ ancient sites).

In all locations, in the north and south, people report a dramatic increase in illnesses over the past five years: new malaria, dengue fever, and digestive issues. Weakness and rashes were also widely reported, chemicals are used for market crops. Medicine is a new expense for all families.

TIMBER TRADING

The timber trade is reduced from previous years, but remains visible and vibrant. In the north every village is trafficking in timber. There were open deals with wood buyers, and tractors carrying sawn timber ‘with permission from above’ and ‘for building homes and pagodas’ traveled easily along the roads. Furniture making shops were visible in multiple locations inside the protected area. In Preah Vihear, a company called Dee Duk, is sending trucks to buy what villagers cut. This activity is visible to rangers and commune level authorities. In the south, locals report a dramatic decrease in available wood to cut and also increased enforcement of certain timber transactions. Many transactions continue, however, especially the trade in dead wood. Rangers watch as motos laden

with *jamnia* leave the forest, “they’re poor. They don’t have money to pay the banks back, let them take some.”

INDUSTRIAL PLANTATIONS AND MINES

There is a gold mine operating at Sa Dambok inside the Think Biotech concession. Think Biotech in Kratie continues to expand its clearing into the northern forested areas of its concession, trucking the wood across the protected area. New goldmining activity was reported and affecting the water in Preah Vihear and Kampong Thom.

Collaborative Management

The relationship between PLCN and MoE rangers is complicated and mired in a long history of antagonism between the grassroots conservation activities of PLCN and forest authorities. This antagonism began with the FA and through that negative relationship transferred to conservation organizations working in the region. Forced by mandate to work with government officials, they also foreclosed participation with PLCN. Since new relationships began with the MoE, this antagonism is considerably less and slow, but important changes are occurring.

What the researchers see does not look like collaboration. It seems that there are two groups doing their own activities, with one group required to ask permission from the other and be accompanied in its activities. The extractive environment inside the protected makes it dangerous for un-armed local citizens to confront illegal forest activities, and all agree that MoE rangers should accompany PLCN while on patrol. In the current system, however, the timing of patrols is dictated by the provincial Department of Environment and community patrollers have to ask permission to patrol. Being aware, as they must be, that some rangers are not enforcing protected area laws, PDoE should encourage spontaneous patrols. If the PLCN and the MoE rangers are collaborating to patrol the forest, community-led patrols would happen when the community decides. The obviousness of continued timber extraction suggests there could be complicity between rangers and loggers. Indeed, sawn timber was often found very close to ranger stations signaling a lack of fear on the part of loggers. The dynamics are different in each province, but elements of what we describe here are present in all locations to different degrees and our data is consistent with monitoring reports from the region (Argyriou et al. 2016, 2017).

PLCN and MoE interact at a number of levels. At the national level, MoE has worked to actively include PLCN in meetings and consultations related to Prey Lang and protected area management. Top officials in MoE and representatives from PLCN share open lines of communication. This can enhance collaboration when PLCN concerns are acted upon with visible changes. For example, a new ranger station was added in an area where PLCN earlier confiscated a large amount of sawn lumber. If this addition combined with PLCN patrols can decrease logging and settlement in the area it could signal effective collaboration. The main activity that contributes to good collaboration between PLCN and MoE rangers is joint patrolling when rangers are dedicated to enforcing protected area laws. When on patrol, people learn to use the new gps equipment together, discuss possible strategies, and learn of new forest dynamics while working alongside each other. This joint patrolling is important.

It was unmistakable, however, that while on patrol with PLCN, the rangers in the lead drove right past illegal logging activities and it was PLCN that stopped tractors and found caches of lumber in the forest. Processing these criminal activities together was tense. On some occasions there was a strong show of productive collaboration, but PLCN had to insist that lumber be measured and recorded. On other occasions rangers showed annoyance and arrogance toward PLCN when they reported lumber stashes. In addition, some rangers were engaged drinking the beer and eating the chickens in villages where stashes were found. This creates suspicion among those attempting to enforce forest laws and inhibits collaboration. On other occasions, PLCN-led patrols went down unused roads, avoiding active areas, or stayed the night in the village hosting two furniture shops before leaving on patrol in the morning, perhaps making sure we would not meet any loggers.

The pull of the timber trade is strong, this is now exacerbated by small-scale corruption associated with new settlements. Neither PLCN nor MoE rangers are immune to these financial opportunities. Not all rangers, however, and not all PLCN.

As for establishing designated zones where 'collaborative management' would be implemented, this is a sound idea, but requires a targeted research agenda toward better understanding what that might look like. This research would include cultural, political, economic, and environmental analysis and knowledge sharing with local communities toward better understanding capacities, limitations, and options at the local level. People are interested in some places, but the problem of market-oriented livelihoods would have to be addressed. Any kind of conservation activities that require financing through market-based activities, crops, minerals, tourism, REDD+... will exacerbate forest destruction because families are looking toward money for survival. In the south, 100% of families we met desired increased market access and were actively clearing new land for market crops. In the north, the desire for the market was not as strong, but the ecological collapse reported over the past three years has caused more families to point energies toward the market. The landscape of the south is better for collaborative community management, but the minds of the people will not support it. In the north, the minds of the people would support it, but the landscape will not. This empirical reality does not foreclose the possibility for a vibrant collaborative management initiative, especially if it had a charismatic leader and funds for developing a regional market cooperative system for food production and sharing, as well as scholarship opportunities for young villagers to learn about sustainable forest living.

While the timber trade remains active, it has slowed considerably. There is no way to know for certain how much of this is from enforcement and how much from supply. Efforts by rangers and PLCN are under-funded and under-staffed, and the roads into and through the forest are many. Nonetheless many in both groups remain diligent in what they can do. New settlement is actively discouraged by rangers, who have opened new stations in multiple locations, and monitored by PLCN. But, there is no framework to dismantle existing settlements actively dealing wood and converting forest for market crops. The situation in the forest is not good, and the reports of rapid development and biodiversity loss in the north should cause alarm.

Climate Change

Another thing that should cause alarm is the paucity of knowledge about climate change. All villages report climate change effects and environmental degradation, but very few have any idea of

the causes of the unstable rains or extreme temperatures. Some people (5%) reported no knowledge of climate change at all. Most (80%) know only what they experience or hear on the news or the weather report. Climate change is: Extreme temperatures; Draught; Rain out of season. Most (80%) believe it comes from deforestation; Some (20%) are aware that factories, garbage, and war are also drivers of climate change; None were aware that burning gasoline (motos, cars, trucks) caused climate change; None were aware of the role of high-input agriculture in climate change; Some (3%) understood that it comes from other countries, but did not understand the connection to development. Even MoE rangers have limited knowledge of climate change, its drivers, mitigation strategies, and/or long-term effects and implications.

Many people reported to us that they did not have any issues with climate change because they don't have any really young or really old people in the settlement. People hear on the radio that the extreme temperatures, or prolonged rains are dangerous for the very young and very old. There is almost no understanding that climate change is a global event that will change the ecosystem of the planet over the next few hundred years. There was no understanding of the cumulative nature of atmospheric carbon, that it does not break down quickly and so with each passing year the amount only grows. People do not understand that the effects of climate change will continue to get worse as time passes. Many people were shocked when they realized their own contributions to climate change, especially those cutting forest for cashew plantations.

Villager recommendations for climate change mitigation:

- Replant trees in the forest
- Protect the forest
- Close the wood market, especially by targeting buyers
- Slow down development
- Close factories
- Increase attention to religion and lok ta, because desire for new 'stuff' is now raised higher than religion

Conclusion

“We had so much... didn't have all the tools and equipment we use today, but we could get so much. Just take a pan down to the river and scoop out the water onto the ground. Three or four scoops and the ground was full of fish” (GD PV 17 Feb 2018).

Traditional practices are intimately connected to shifting cultivation, hunting, healing, and community solidarity, but especially forest health. In Prey Lang, we notice different social and physical environments in the northern provinces of Steung Treng and Preah Vihear, and those in the south in Kampong Thom and Kratie. In the north, since 2013 forest conversion to plantation, especially in Steung Treng, has dramatically reduced the forest. Once isolated and market-independent villages are now fully connected to markets and the forest is rapidly disappearing. Village solidarity has decreased in all locations in the north, where people report social relationships with money that are stronger than social relationships between villagers. The health of villagers, of lok ta, traditional practices, and the forest are intimately connected, and as the forest falls, people report the conversion of swidden forests to market crops, the absence of game in the

forest, decreased health, fractured solidarity, and decreased use of forest knowledge. In the south, people report the dramatic loss of fish and game, as well as the decreased availability of gold. There is not as much nostalgia for the once healthy forest in the south as was reported in the north. There could be an ethnic bias worthy of further investigation.

Development is moving rapidly with very few cautionary voices. People shift easily from tossing handfuls of fish out of the stream to buying a kilo of fish from the motorcycle vender that comes to the village—moto-fish. Not without consequence, however, and people complain about the chemicals, the illness, and the loss. But the moto-fish come and people hunt for money in order to buy them. The only avenues for money are cash-crops, logging, resin, and gold. Medical expenses, tractors, houses, and weddings, were the most important cash purchases people reported. The majority of villages purchase 80-100% of their food from the market. Only in Spong and Krabie Mui is there enough wildlife to support 50% wild food consumption. Decreases in wildlife are most dramatically connected to forest conversion for plantation agriculture. Hunting and fishing for sale to outsiders also affects wildlife availability. The tension between conservation of forest resources and the need to enter a cash economy for basic subsistence as well as luxury items, is a glaring issue. This drives both the logging and plantation conversion, as well as the complicity of rangers and activists.

Collaborative management as a forest management experiment in Prey Lang brings together the corrupt, the virtuous, and those in-between. Across both rangers and community activists all three types of persons are active and struggling together and against each other. There is substantial mistrust on all sides and across groups, largely due to the ambivalence of the competing needs for conservation and cash. Both rangers and PLCN face substantial challenges facing the activities of other government officials. Provincial and district level governors promote in-migration. MAFF promotes plantation conversion to feed initiatives for cassava and cashew, and police turn a blind eye to timber traffic across villages outside of the protected area. Considerable traffic continues under the guise of local-level building projects for pagodas, homes, and schools.

Climate change. What to say here? Really. It is shocking how little people know and how almost all practices inside the protected area are exacerbating the problem of climate change with no effective activities toward its mitigation. This is not an issue specific to Cambodia. It is a global issue. People report two years of unstable rains and affected harvests. The first year, 2015-16, there was drought. The second year, 2016-17, was extended rains. Crop failures include decreased rice production, with rice harvests down 50% in most locations during the 2017 season. Cashew failure in 2017 was also reported- the trees did not fruit in many locations. It is difficult to know what the next season will bring and how this will affect families living in or next to the Prey Lang.

There is a global desire for healthy forests that cannot withstand the global desire for the profits and products of the global market. We are in a collective pickle, and there is nothing about current activities in the PLWS to suggest any successes in addressing the most pressing issues of our times: Excesses of atmospheric carbon and ecological collapse.

Recommendations

MoE

- **Urgent need to identify, demarcate, and patrol the core area**

This is not a new recommendation. The resources necessary to demarcate the core area are substantial. Collaboration between rangers, PLCN, and monks could identify the boundary and tree ordination ceremonies can demarcate the core conservation zones. Community patrols should be encouraged in the core conservation areas, which can leave rangers to law enforcement in the community use zones.

- **Urgent need to stop further road construction**

It is unclear why there is so much development inside the protected area in the north. If there is actual desire to conserve forest resources, then all development activities should be stopped.

- **Train MoE staff and all communities inside the protected area about climate change**

- Be aware that development organizations are not good sources of information about climate change, causes, effects, and possible strategies

There is a very difficult truth about the current era. Development causes climate change. This is based on unequivocal scientific investigations by large teams of independent scientists (IPCC 2014). Development organizations like the FAO, UNDP, World Bank, JICA, USAID, and others, all profit from and depend on development for their existence. They are development organizations. Policies currently being promoted by development organizations are not mitigating climate change, and this year atmospheric carbon raised to 410 parts per million with no signs of slowing down. The situation in Prey Lang, with massive species decline in the face of plantation conversions is one small testimony to the relationship between ecological collapse and development. International policy makers may not be attending to the best interests of all global inhabitants.

- **Stop the timber traffic**

- The ministry will be unpopular with villagers, and local, district, and provincial authorities
- This action could also provoke national level actors
- Forest health is impossible without it

The last statement, about forest health is the critical element. If the ministry is serious about forest health, serious law enforcement must begin. It will not be easy. I suggest that real conversations about the coming impacts of climate change and honest discussions about the impacts of continued economic growth should be a point of departure for this initiative. These discussions should be had at all levels and should NOT be led by international development or conservation organizations.

- **Respect the work of community patrollers**

- Promote independent patrols
- Promote un-scheduled/spontaneous patrols
- Respond to forest crimes in accordance with protected area laws

Mistrust underlies all relationships in PLWS. This is not a bad thing and should be used to the ministry's advantage and channeled toward productive conservation initiatives. Collaboration

between community patrollers and ministry rangers are vital, but are currently not enhancing conservation to the optimal effect.

- **Stop the influx of migrants**
 - Village heads report pressure to accept migrants
 - Can profit from migrant land claims
 - Pressure is reported to come from provincial and district level authorities
 - Problem framed in terms of population growth

The MoE has ultimate jurisdiction inside the protected area boundaries. Provincial, district, commune, and village authorities are all benefiting from increased migrant incursions. It is very difficult to enforce protected area laws when other appointed and elected officials work to undermine those same laws. The recommendation is to enforce non-market economies inside the protected area and establish collaborative management zones that include village areas inside of which collective subsistence economies are pursued. Many people will leave voluntarily and those interested in forest restoration and sustainability will remain. The problem of population growth is directly linked to development and market economies and is beyond the scope of our research, but the costs of maintaining large populations in conservation areas are evident from our data.

- **Pursue cooperative land management arrangements in as many village areas as possible**

- Establish jurisdiction over the protected area

This connects to the above recommendation and will center on establishing cooperative production for community subsistence inside the protected area. Perhaps funding from international conservation organizations could be marshalled to support forest and soil reclamation activities and establishing cooperatives.

- **Promote dialogue with new migrant residents inside PLWS**

- Village heads may not have authority over or relationships with these residents

MoE should make very clear land-use policies inside the PA. Some new migrants arrived before MoE created the Protected Area, but MoE still has jurisdiction to dictate how land is used inside its boundaries. The photos below of plantation conversion should be disturbing. All that land can be reclaimed and put toward enhancing rather than destroying biodiversity.

- **Stop the conversion of forest toward market crop production**

- Conversion areas suffer massive species decline

- **Promote cooperative, non-market livelihood strategies**

- **Enforce the law against motorized equipment inside the protected area**

- Strictly curtail moto use – only patrollers
- Ban tractors, chainsaws, trucks, and excavators

This would have massive impacts on forest health. Migrants currently use excavators and clear in one year what it would take local people ten years to clear. Chainsaws and tractors make logging much faster and easier.

- **Stop the traffic of plantation trucks hauling lumber across the protected area**

- The road facilitates resource extraction
- **Close the mining concession inside the protected area**
 - It is affecting water sources that feed the forest and flow into the Mekong and Tonle Sap rivers

PLCN

- **Establish regular, independent patrols in the core areas**
 - Begin demarcating the area
 - Perhaps ordain the trees at the boundary zones in a joint celebration with the MoE
 - Initiate and coordinate collaborations with MoE to report forest crimes
 - Initiate and coordinate collaborations with conservation organizations to record and preserve natural resources in the protected area

PLCN is an important part of the conservation dynamic in Prey Lang. As local community members and consisting primarily of forest users, PLCN possess special skills and have a vested interest in forest conservation (Turreira-García et al. 2018). It is clear that PLCN makes local-level officials uncomfortable, and this is important. Conservation organizations and MoE could capitalize on that, if forest health is the goal.

- **Avoid organizing as a bureaucratic entity**

PLCN should maintain its structure as a grassroots community organization facilitated by volunteers. Writing by-laws and establishing the necessary bureaucratic structures to become a formal organization will consume valuable time and energy and decrease PLCN effectiveness.

- **Promote multi-village cooperatives that can establish and manage collaborative jurisdiction inside and adjacent to the protected area.**
 - Convert community forest areas into these collaborative management areas
 - Attempt to enlarge CF to extend into protected area
 - Tenure not limited to fifteen years (ENR Code Article 286)
 - Can incorporate larger land areas

In order to have a participatory role in activities within Prey Lang, some kind of collaborative management structure will need to be created that centers on and comes from well-established indigenous populations within and adjacent to Prey Lang. This can happen at the village level and enlist the energy of people not involved in patrolling or conservation efforts. This can be a good way to increase the participation of women and elders who may not have the desire or ability to participate in active patrols.

- **Promote market-independent livelihood strategies and Agro-forestry initiatives**

This goes against very strong forces and the whole industry of international development opposes it. It is for this reason that I think it is of the utmost importance. It is unclear, for example, why cassava and cashew are promoted in Prey Lang, but not agro-forestry. As noted in the recommendations for climate change education, the development industry may not be protecting the interests of the planet's population.

- **Promote respect and care-taking of natural resources, following long-standing agreements with lok ta**

The punishments of lok ta have arrived, but are delivered by development and market relations rather than through traditional methods. Traditional practices would never cause such destruction. It is possible that lok ta is not superstition.

- **Increase the production of vegetables, fish and meet toward cooperative food security with minimal forest pressure inside the protected area**

With a ban on motorized tractors inside the protected area, cows and buffalo can return. Cooperative food production will be vital during the transition from compromised ecosystems back to productive systems. Food sharing and small-scale local production will be important.

- **Discourage motorized vehicles and equipment within the protected area**

Patrollers on motorcycles should be the only motors heard inside the protected area.

Conservation Organizations

- **We do not provide data on conservation initiatives in this report as none are active at the moment, but conservation initiatives have impacts on forest health and are included in our recommendations**
 - Understand that local swidden, fishing, or hunting activities are not the primary driver of natural resource over-exploitation
 - Understand that plantation development, mining operations, and illicit national and international timber extraction and wild animal trade are the primary drivers of deforestation and biodiversity loss
 - Work within existing systems and do not create and fund new conservation groups. Effective collaborative management requires organizations to collaborate with grassroots conservation initiatives.

These recommendations confront core values of conservation organizations that too often see local people as the problem. It is vital to begin seeing elite livelihoods as the problem. Only in this way can we all work toward sustainability.

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Annex 1: Satellite Imagery of PLWS



2001 Prey Lang Deforestation: Pink dots
inside blue shapes



2016 cumulative Prey Lang
Deforestation: Pink



Southern Deforestation in 2016: Pink

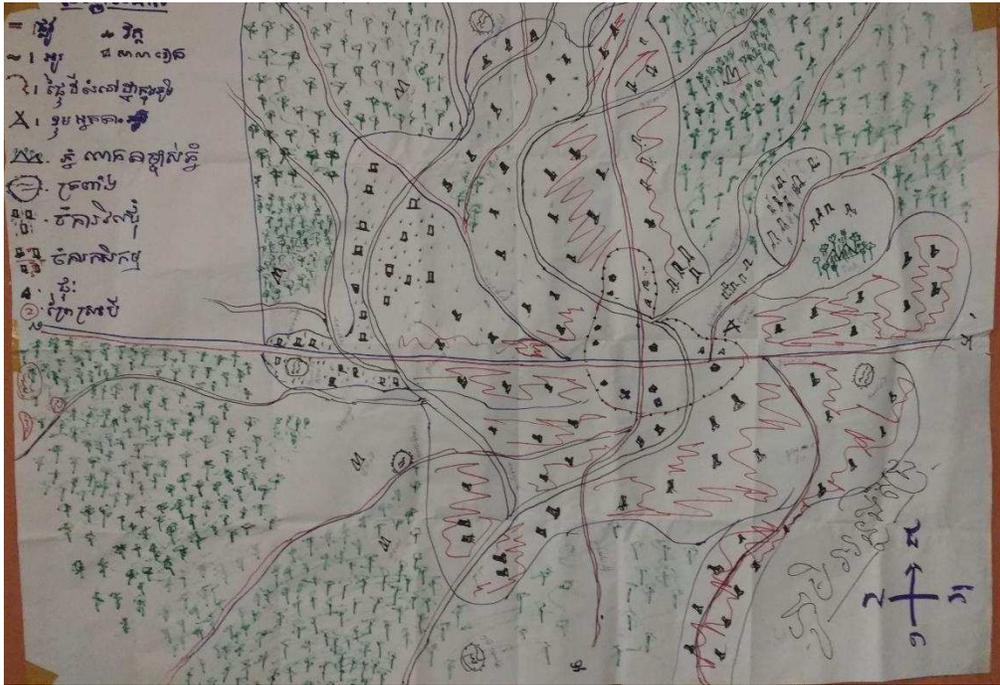


Northern Deforestation in 2016: Pink; Yellow stars show key boundary points

Annex 2: Community Maps and Drone Images

Featured Villages: Anlong Chrey, P'auv, Viel Po

VILLAGE MAP ANLONG CHREY: ភូមិអន្លង់ជ្រៃ



Drone Photos: រូបភាពពីម៉ាស៊ីនច្រូន



Village with Swidden south ផ្នែកខាងត្បូង



Swidden fields to west វាលខាងលិចភូមិ



Edge of plantations in north នៅខាងត្បូងព្រៃឈើដុះនៅ



Swidden and forest in south ចំការខាងជើងភូមិ



New plantations north ចំការថ្មីនៅខាងជើងភូមិ



New plantations east ចំការថ្មីនៅខាងកើតភូមិ



Plantations south, with forest beyond ចំការនៅខាងត្បូងដោយមានដោយមានព្រៃឈើ



In the west, there are mountains ខាងលិចភូមិមានព្រៃភ្នំនិងចំការ

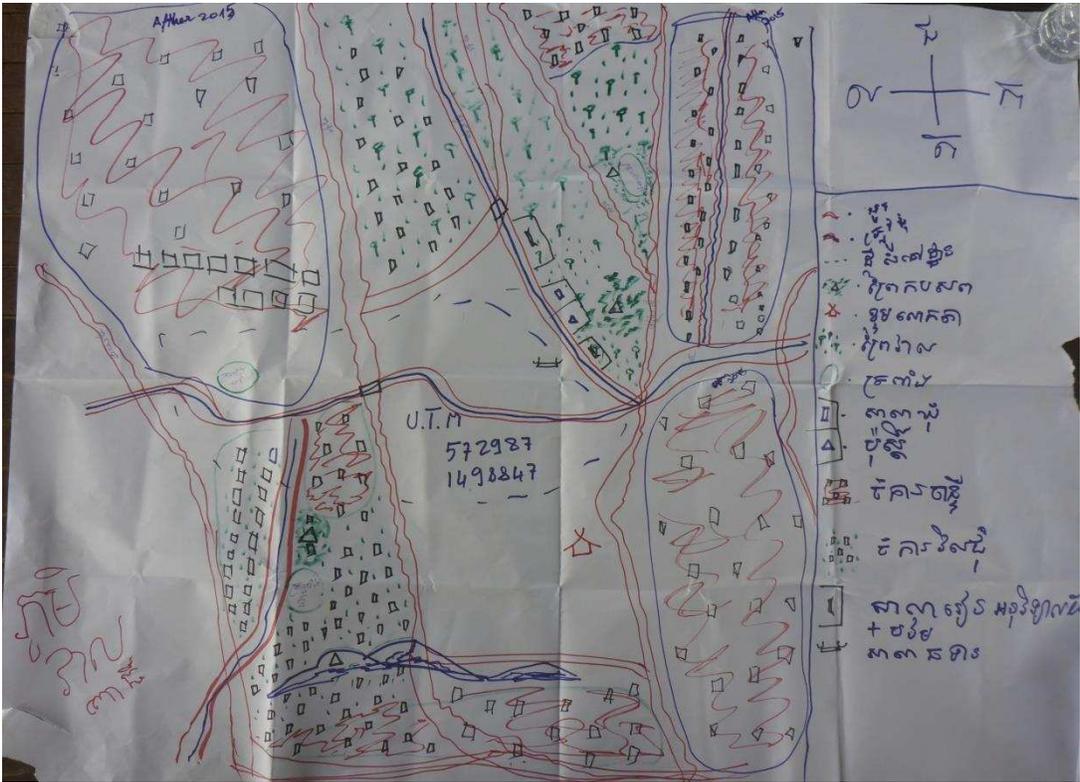


South: there is a large number of new plantations. ខាងត្បូងភូមិមានចំការច្រើនបានដាំដុះរួចហើយ



North: many remaining forest and some are far away from the village. ខាងជើងភូមិមានព្រៃនៅសល់ច្រើននិងមានចំការខ្លះនៅឆ្ងាយពីភូមិ

VIEL PO VILLAGE ភូមិវាលពោធិ៍



Drone Photos: រូបភាពពីម៉ាស៊ីនជ្រូន



មានការកាប់ចំការចាស់ថ្មីនៅជុំវិញភូមិវាលពោធិ៍ទាំងអស់មានតែភ្នំមួយប៉ុណ្ណោះដែលនៅសល់ព្រៃ(ជាព្រៃជំនឿ)

There is new plantation conversion all around Veal Pou village. No swidden fields remain.

Only one forested mountain remains, where Lok Ta is very powerful

Annex 3: Research Questions

Climate Change and Co-management in Prey Lang: Social experiments in conflict transformation

Grant# CAORC RA-235021-16

Research Questions

General Scoping questions

Age, ethnic affiliation, years in location, home province

Size of household

Primary livelihood

Possessions

Land holdings

Crops

Animals

Yield

Livelihood questions

How much for market sale/domestic use?

Do you buy your food from the market? What percent?

Have you experienced climate change effects?

Do you have strategies to plan for bad seasons?

From your perspective, what is the best way to use the land?

General life questions

How do you measure success?

Are there benefits to keeping forest?

Where do you experience competition in your life?

Where do you experience cooperation?

What does your religion say about success?

Do you know what causes climate change?

Does climate change make you concerned about the future?

Traditional practice questions

Which religion(s) do you hold?

Are your beliefs different from your neighbors?

What does your religion say about competition and cooperation?

Where are the respected lok ta places?

How do you respect lok ta?

Over what activities and resources does lok ta have authority?

Do you have to ask lok ta permission to use resources?

How does lok ta help with hunting game?

How do you know how to behave properly?

What activities make lok ta angry?

What kinds of punishments does lok ta do?

How have practices changed in your lifetime?

What causes changes in practice?

What results come from these changes? Has your life improved?

Annex 4: List of Villages and Stations Visited

Stations:

KT: Preah Atut, Jarut T'oal, P'auv

KR: Snaka Phnom Krahom, O'Kruek, Trapiang Thom

PV: Beung Trapiang Prey

Villages:

ST: Tla Barivat; Anlong Chrey Commune; Morn; Anlong Chrey; P'auv; Viel Po; Anlong Pe; Toal; Spong; Krabie Muy.

KR: Sambo: Beung Chas Commune: Koh Andechey; Kampong Krabeung; Kampong Domrie; Beung Chas.

KT: Santuk: Boeng Lvea Commune: Roliet Doit; Roliet Thom; Rong Japon; Snong Oun; P'auv.

PV: Chey San; Thmea Commune: Pnyak Roleuk; Srie Viel; Thmea; Chamrarn.